

CHEM 5650 - INSTRUMENTAL ANALYSIS LABORATORY - Spring 2022

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Office Hours: Monday 3-4 PM and Thursday 2 -3 PM and by individual appointments

Laboratory Meetings: Tuesday/Thursday 8:30 – 11:30; ML 362 and ML 364
Reference Text: Principles of Instrumental Analysis; Skoog, Holler & Crouch, 6th/7th Ed.
Laboratory Procedures: Individual handouts provided for each of the laboratories

Teaching Assistant: Jesse Brown (jesse.brown@usu.edu)

In order to continue to provide various forms of face-to-face instruction at USU, and to limit the spread of COVID-19, students are asked to follow certain classroom protocols during the spring 2022 semester. These protocols are based on CDC, state, and local health department guidelines and requirements are in place not only for your safety but also the safety of the entire campus community.

- Face coverings are requested in all classrooms and teaching laboratories. Follow faculty instructions regarding social distancing and entering or exiting classrooms.
- Stay home when you are sick, however mild your symptoms.
- Wash your hands frequently with soap and water.

Laboratory Fee Statement: Course fees of \$75 are used to pay for supplies, materials, repair and replacement of equipment and teaching assistant support.

Laboratory Grading:

Specific Labs and associated Reports (9 @ 100 pts / report) 900 pts

Final laboratory grades will be assigned based on University policy using the following minimum percentages; A: 90-100%, B: 80-89%, C: 70-79%, D: 60-69%, F: below 60%. Plus and minus grade modifications are assigned according to University policy. **Note:** Grade cutoffs may change to lower percentages (but **not** higher) depending upon the overall performance of students in the laboratory.

Objectives: Analytical chemistry is a constantly evolving discipline. Analytical chemists constantly strive to improve the sensitivity, speed, and accuracy of established analytical techniques, to extend existing techniques to new analytical problems or applications, and to invent new instrumental tools for chemical and biochemical analyses. This laboratory is designed to supplement the Chem 5640 classroom instruction by familiarizing students with established instrumental techniques currently used in industrial and academic analytical laboratories. The overall goal of this laboratory is for the student to learn how to use analytical instrumentation to solve chemical problems. Analytical problem solving is a three-step process. First, you must recognize the nature and scope of the problem that you need to solve and identify those chemical and physical properties of a sample that can be exploited to provide the necessary information to help solve the problem. Second, you must learn to assess the relative merits of competing techniques and select an instrumental method that is most appropriate for the problem. Last, you must learn how to interpret

your results within the limitations of the instrumental method used to obtain them. These problem-solving skills are sufficiently general that you should be able to apply them to new chemical analysis problems later in your career.

Laboratory Safety: Safety regulations are to be observed at all times. Failure to obey safety rules during a laboratory will result in a point penalty awarded for that laboratory. Repeated offenses will result in dismissal from the laboratory. Laboratory points will also be deducted for failure to clean up and properly dispose of used chemicals at the end of the laboratory period. **Approved safety eyewear, proper personal protective equipment (including gloves and Covid approved facemasks) and laboratory coats are to be worn at all times during the laboratory.**

Notebooks: All students must maintain a bound laboratory notebook to record and organize experimental results. Appropriate notebooks are sold through the University bookstore. This notebook preferably should have duplicate (carbon) numbered pages that can be removed and turned in to your instructor after every laboratory period in which data is collected. Alternately, students can make photocopies of notebook pages to turn in by the end of the lab day. Notebooks should be organized as follows:

Table of Contents:

Leave a couple of pages for a Table of Contents; keep it up to date during the semester. Data in your notebook should be entered on consecutively numbered pages. Date every page that data is taken on. **Start a new page for each day's experiment.**

Include the following information prior to the start of each laboratory experiment (Instructor/TA may check during the lab and deduct points if not completed).

Title of the experiment

Date experiment is to be conducted

Objective: Include a brief statement of the experimental goals.

During the laboratory period, make sure to record:

Laboratory Coworkers names for that day's laboratory if appropriate

Procedural Notes: Include any modifications to the general procedure provided or any unusual observations or problems encountered.

Always include details on the specific sample being analyzed (source, manufacturer, unknown number, etc.). This is critical for proper grading. Each student should individually analyze duplicate samples for any quantitative experiment and students should each analyze a different set of samples. Group members, as needed, may share common reagents or calibration standards needed in a specific laboratory experiment. Each group member prior to use should confirm the proper preparation of such common reagents or calibration solutions (i.e., double check the preparation procedure).

Tabulated Data: Include all data collected as part of the experimental procedure.

Qualitative data collected (like spectra) should be printed out and added to your notebook.

These may be included in the data collected section (leave a space to tape them in, you may cut and paste them, reducing them in size if necessary to fit after the class period) or include them as an appendix at the end of the lab information (i.e., after last recorded data). Original copies should also be included as an appendix with the submitted laboratory report.

Calculations: Include any pre-lab calculations and calculations performed during lab.

Note: Late laboratory reports may be assessed a penalty (up to 10 points/week late), at the discretion of the Instructor and TA. Normally all lab reports are due within 2 weeks of completing a lab.

List of Chem 5650 Instrumental Analysis Laboratories for Spring 2022

This year there will be 2 students per experiment (see the lab rotation schedule provided)

- Laboratory A Electronics Laboratory
- Laboratory B Ion Selective Electrode Fluoride in Water Laboratory
- Laboratory C Atomic Absorption Laboratory
- Laboratory D UV-Visible Spectrometry Laboratory
- Laboratory E High Performance Liquid Chromatography Laboratory
- Laboratory F Gas Chromatography/Mass Spectrometry Laboratory
- Laboratory G Fourier Transform Infrared Spectrometry Laboratory
- Laboratory H MALDI-MS Laboratory
- Laboratory I Florescence Laboratory

Students will be divided into 4 groups of 2 students and this grouping will determine the order that students perform the various experiments in the spring 2022 semester (see attached schedule).

The Lab closes for scheduled experimentation on Thursday April 7th. The week of April 12/14 is reserved for any make-up labs if approved by the instructor. Mandatory final lab clean up is to be completed no later than Tuesday April 19. Any late lab reports must be turned in/are due by April 26 at 5 PM in the Instructor's office.

Final Note:

In accordance with the Americans with Disabilities Act, reasonable accommodation will be provided for all persons with disabilities in order to ensure equal participation in Chemistry 5650. A student who requires an accommodation must contact the Instructor. The disability must be documented by the Disability Resource Center. In cooperation with the Disability Resource Center, reasonable accommodation will be provided for students with disabilities. Course material may be requested in alternate formats through the Disability Resource Center.